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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/812,668	03/20/2001	Yasuhiro Koizumi	19036/37209	2502

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EXAMINER

HASSANZADEH, PARVIZ

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 10/28/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/812,668

Applicant(s)

KOIZUMI ET AL.

Examiner

Parviz Hassanzadeh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 14 June 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 6,7,9-11,13-16 and 18-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-5,8,12 and 17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) 1-20 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on 20 March 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17 2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-17, drawn to an apparatus, classified in class 118, subclass 723E.
- II. Claims 18-20, drawn to a method, classified in class 427, subclass 523.

The inventions are distinct, each from the other because of the following reasons:

Inventions Group I and Group II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus can be used for ion implantation or sputter etching rather than ion plating.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

This application contains claims directed to the following patentably distinct species of the claimed invention:

Species 1 , Fig. 1, pages 11-14;

Species 2 , Fig. 3A, page 16;

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Species 3 , Fig. 3B, page 17;

Species 4 , Fig. 3C, pages 17-18.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, no claims are fully generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

During a telephone conversation with Jim Napoli on 10/22/02 a provisional election was made with traverse to prosecute the invention of Species 1, Fig. 1, claims 1-5, 8, 12 and 17.

Affirmation of this election must be made by applicant in replying to this Office action. Claims

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6, 7, 9-11, 13-16 and 18-20 are withdrawn from further consideration by the examiner, 37

CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Drawings

Figure 4 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-5, 8, 12 and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, lines 5-8, it is not clear how the power unit is coupled to the substrate holder. it is suggested to revise the paragraph as "*a power supply unit including an RF power unit for*

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supplying power to an inside of the vacuum chamber through the substrate holder for changing a film forming material into a plasma and depositing the film forming material from the plasma on the substrate”.

In claims 1, line 9, it is suggested to insert “further” before “includes” and in line 10, to insert “to the substrate holder, the bias power supply unit” before “composed”.

A similar argument and suggestion is applied to each of the other independent claims 2-4.

Claim 8 recites the limitation "second" in line 5. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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Claims 1-5, 8, 12 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (Fig. 4, pages 1-3) in view of Yamada (JP 10-4085 A).

The admitted prior art (Fig. 4) teaches a conventional ion plating apparatus 60 comprising:

a vacuum chamber 61;

a substrate holder 62 for holding a substrate 65; and

a power supply unit including an RF power supply 66 coupled to the target 62 for generating a plasma, and a DC bias power supply 67 for applying a negative bias voltage on the substrate holder 62.

The admitted prior art fails to teach the bias power supply having a pulse bias component corresponding to a pulse output having a positive value for a predetermined time, with a cycle set in a range of 1KHz to 1GHz.

Yamada teaches a plasma processing apparatus (Fig. 1) including a bias supply unit comprising a DC power source 7 and an RF power source 6 wherein the DC and the AC voltage are alternatively applied to a substrate holder 2 as shown in Fig. 2 such that the bias voltage changes periodically from positive to negative and thus removing charge up on the substrate holder (Abstract, paragraphs 0025-0027). The RF AC power supply 6 outputs a frequency of 13.56 MHz via blocking capacitor Cb (paragraph 0018).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the bias mechanism as taught by Yamada in the apparatus of the admitted prior art in order to remove charge up on the substrate holder.

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Regarding claim 2, 3, 17 (the ratio of the predetermined time of the pulse bias to the cycle of the bias voltage): the bias system of Yamada includes a switch 4 by which the timing of the AC/DC power can be adjusted to a desire value.

Regarding claims 3, 4 (the pulse bias being a square wave pulse): the AC and square wave generators are considered as art recognized equivalent for the same purpose of generating a time-varying (pulsing) voltage. See MPEP 2144.06, Art Recognized Equivalent for the Same Purpose, Substituting Equivalents Known for the Same Purpose (*in re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982)).

Regarding claims 8, 12 (low pass filter and band pass filter): the use of filters between the plasma power source and the bias power source is considered a well known feature in the art and the employment of such filters would have been obvious to one of ordinary skill in the art for the purpose of eliminating the output from one source reaching and interfering with the other source.

Claims 1-5, 8, 12 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (Fig. 4, pages 1-3) in view of Okano et al (JP 56-81678 A).

The admitted prior art (Fig. 4) teaches a conventional ion plating apparatus 60 comprising:

a vacuum chamber 61;

a substrate holder 62 for holding a substrate 65; and

a power supply unit including an RF power supply 66 coupled to the target 62 for generating a plasma, and a DC bias power supply 67 for applying a negative bias voltage on the substrate holder 62.

The admitted prior art fails to teach the bias power supply having a pulse bias component corresponding to a pulse output having a positive value for a predetermined time, with a cycle set in a range of 1KHz to 1GHz.

Okano et al teach a plasma processing apparatus (Fig. 5) including a bias supply unit comprising a DC power source 35 and an RF power source 33 wherein the DC voltage is adjusted by the superimposed AC voltage on the substrate holder 25 (Abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the adjustable bias mechanism as taught by Okano et al in the apparatus of the admitted prior art in order to adjust and thus control the bias voltage applied to the substrate holder. The frequency range of 1KHz to 1GHz is also considered typical values selected for a bias voltage supply.

Regarding claim 2, 3, 17 (the ratio of the predetermined time of the pulse bias to the cycle of the bias voltage): the ratio of the predetermined time can be controlled by changing the frequency of the AC power source.

Regarding claims 3, 4 (the pulse bias being a square wave pulse): the AC and square wave generators are considered as art recognized equivalent for the same purpose of generating a time-varying (pulsing) voltage. See MPEP 2144.06, Art Recognized Equivalent for the Same Purpose, Substituting Equivalents Known for the Same Purpose (*in re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982)).

Regarding claims 8, 12 (low pass filter and band pass filter): the use of filters between the plasma power source and the bias power source is considered a well known feature in the art and the employment of such filters would have been obvious to one of ordinary skill in the art for

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the purpose of eliminating the output from one source reaching and interfering with the other source.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Sakamoto et al (JP 58-1000672) teach a plasma processing apparatus including an AC/DC superimposed power source for applying a pulsed bias voltage on a substrate holder 7 by an RF power source 11 and a DC power source 13 (Fig. 2);

Goring et al (US Patent No. 4,464,223) teach a plasma reactor including a bias power unit including an RF power source 36 and a DC power source 42 (Fig. 2);

Martin et al (US Patent No. 6,033,587) teach a plasma reactor including a bias system including an AC voltage superimposed on a DC current (Fig. 1);

Tomoyasu et al (US Patent No. 6,264,788 B1) teach a plasma reactor including RF power sources 151 and 141 coupled to a common electrode 21, and being separated from each other via a capacitor 100 and low pas filter 144 (Fig. 6);

Tamura et al (US Patent No. 5,906,684) teach a plasma reactor including a variable DC power source 13 and an RF power source 12 coupled to a substrate holder 47 (Fig. 10);

Kaji et al (US Patent No. 5,290,993) teach a reactor including a bias power supply unit having a an RF 16 and a DC 18 power source (Fig. 1); and

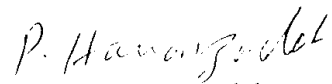
Roderick et al (US Patent No. 6,074,488) teach a plasma reactor including an AC/DC unit coupled to a substrate support.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Parviz Hassanzadeh whose telephone number is (703)308-2050. The examiner can normally be reached on Tuesday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory L. Mills can be reached on (703)308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are (703)872-9310 for regular communications and (703)872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0661.


Parviz Hassanzadeh
Examiner
Art Unit 1763

October 23, 2002